August 7, 2017

**Ilene M. Munk**
Direct Dial: (503) 477-8660
*imunk@foleymansfield.com*

**VIA E-MAIL AND US MAIL**

Ms. Lori Cora
Office of Regional Counsel
Region 10
Environmental Protection Agency
1200 6th Ave., Suite 900
Seattle, WA 98101-3140

Re: Administrative Settlement Agreement and Order on Consent for Removal Action, In the Matter of: GASCO Sediments Site within Portland Harbor Superfund Site, Portland, Multnomah County, Oregon, U.S. EPA Region 10, CERCLA Docket No. 10-2009-0255, NW Natural and Siltronic Corporation, Respondents

Dear Ms. Cora:

Siltronic seeks your assistance in resolving an untenable situation that has arisen under the above referenced order. As you are aware, Siltronic owns real property located on the western side of the Willamette River between RM 6 and 7 within the Portland Harbor Superfund Site ("PHSS"). Siltronic's property is adjacent to property owned by NW Natural, and approximately half of the current Siltronic property was owned by NW Natural from 1940 to 1960. The two companies agreed to participate in an early action as set out in the above order, which you negotiated on behalf of the EPA (the "Order"). Work is proceeding under the Order, but recent events have occurred which are extremely concerning to Siltronic.

The Order required the parties to submit a draft Pre-Remedial Basis of Design Technical Evaluation Work Plan with a deadline for submission to the EPA of July 20, 2017. NW Natural had previously informed project manager Sean Sheldrake and Siltronic during a meeting in Seattle several months ago that NW Natural would not send the work plan to Siltronic before it went to EPA. NW Natural submitted the work plan a full week before the July 20, 2017, deadline without ever disclosing the plan to Siltronic, or seeking Siltronic's input. NW Natural did not even copy Siltronic's legal counsel when NW Natural emailed the submission to EPA.

Having been excluded from NW Natural's submission, Siltronic nonetheless submitted the material that related to Siltronic's own performance under the Order to Mr. Sheldrake on the deadline of July 20, 2017. See Attachment 1. In response, in an email dated July 25, 2017, Mr. Sheldrake informed Siltronic that he would not consider Siltronic's submission, but would instead merely "place your letter in our file" and restrict his review to NW Natural's submission. See Attachment 2.

This outcome places Siltronic in a very difficult position. Siltronic is a party to an order that holds Siltronic jointly and severally liable with NW Natural "for carrying out all activities under the order,"[1] but Siltronic is not being provided any say in deliverables submitted under the order because NW Natural is not providing it any opportunity to participate in the preparation of the deliverable. This is not a situation in which any company would be happy to find itself in. Siltronic is committed to fulfilling its obligations under all orders to which it is subject, but Siltronic must be permitted to be an active participant in work for which it might be expected to pay. Any other outcome raises due process concerns as well as issues of fundamental fairness. *See, e.g. In the Matter of LCL Management, LLC*, 1999 WL 362890 at *2. Mr. Sheldrake suggests that Siltronic "work with NWN to send EPA comprehensive deliverables, that include all respondent concerns," but this suggestion does nothing to provide Siltronic the opportunity to be heard by EPA and ignores NW Natural's express statement that it will not work with Siltronic. See Attachment 2. Given the legal implications of NW Natural's actions, Siltronic felt it was appropriate to reach out to EPA counsel at this point.

Siltronic suggests that one of two outcomes could resolve the current impasse. First, EPA could amend the scheduling of future deliverables to add a deadline for NW Natural to share its draft deliverable with Siltronic. Siltronic in turn could be subject to a deadline to return the draft with its comments for finalization and submittal to EPA by NW Natural. Adding this deadline would ensure Siltronic's ability to contribute to future final deliverables.

A second possible solution would ensure that the Gasco Sediments site is addressed as contemplated in the Order by Respondents whose contribution to the contamination requires a removal or remedial action. At present, it is not clear whether discharges from Siltronic's property would require any in-river remediation at all. As discussed below, it is possible that Siltronic's discharges[2] have been removed as a result of very successful uplands in-situ enhanced bioremediation efforts or have been reduced due to natural attenuation to a point at which no further action is required. If this is the case, Siltronic should be released from the Order.

The scope of Siltronic's work under the Order is restricted to "Area 1,"[3] defined loosely in the Revised Final Work Plan as the area in the river affected by TCE from the Siltronic site.[4]

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[1] Order at p. 6.

[2] Siltronic's discharges are restricted to TCE from its operations, which were present in previous groundwater sampling as a plume extending from the Siltronic property towards the river. The last sampling was conducted in 2010.

[3] The parties submitted a Revised Final Work Plan dated March 1, 2010, in which the parties agreed that "Siltronic has responsibility for performing any applicable work in Area 1 adjacent to the Siltronic property." NW Natural is responsible for all other work. "NW Natural has the responsibility for managing completion of the work, including selection of consultants and contractors to perform the work, except as related to performance of work in Area 1 adjacent to the Siltronic property." Revised Final Work Plan, Gasco Sediments Cleanup Action, March 1, 2010, at p. 114.

The current extent of Area 1 is unknown. A remediation system aimed at reducing TCE levels, the EIB system has been in place since 2009. Siltronic believes that the size of Area 1 has been reduced, perhaps even eliminated, by the operation of the remediation system over a period of 8 years. The May 2012 Draft Engineering Evaluation/Cost Analysis Gasco Sediments Cleanup Action noted that the size of Area 1 had been reduced dramatically (by 70 percent for daughter product cis-1,2-DCE and by 35 percent for daughter product vinyl chloride) from 2005 to 2012, and that no TCE above the NRWQC HH-org screening level values was detected at all in the 2010 sampling. Thus, it is indisputable that Area 1 is smaller than delineated in the 2010 Revised Work Plan. It is possible that Area 1 as described in the Revised Work Plan no longer exists and that Siltronic would have no further obligations under the Revised Work Plan.

Perhaps NW Natural's exclusion of Siltronic is an implicit recognition that the main driver for the design of the early action at the Gasco Sediment Site is the contamination that has emanated from NW Natural's property. In fact, this latest incident is simply more evidence that NW Natural views itself as the sole performing party under the Order. NW Natural's July 13, 2017, submission assumes that NW Natural will be the performing party, and does not allocate any task to Siltronic or otherwise indicate that NW Natural views Siltronic in having a role under the Order. Siltronic submits that if NW Natural is performing all of the work required under the Order, and has no interest in involving Siltronic in the work, that EPA can acquiesce in that situation and simply remove Siltronic from the Order. However, Siltronic should not be subject to liability through the unilateral actions of another party whose interests are adverse to Siltronic's. Siltronic would welcome the opportunity to discuss this further with you and to provide any technical information that might assist you.

Sincerely,

Ilene M. Munk

Ilene M. Munk
Encls.
cc: Sean Sheldrake, Environmental Protection Agency *(via email w/encl.)*
Myron Burr, Siltronic Corporation *(via email w/encl.)*
David Rabbino, Jordan Ramis *(via email w/encl.)*
Mike Murray, Maul, Foster & Alongi *(via email w/encl.)*
Dana Bayuk, Oregon Department of Environmental Quality *(via email w/encl.)*
Patricia Dost, Pearl Legal Group *(via email w/encl.)*
Bob Wyatt, NW Natural *(via email w/encl.)*

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[4] Area 1 is defined in the Revised Final Work Plan as the area where "the plume of TCE and its degradation products ... extends from the former UST area west of Siltronic FAB 2 several hundred feet into the Lower Willamette River, where the plume discharges into the Lower Willamette River in an area designated by Siltronic as Area 1." Revised Work Plan at p. 72.

# ATTACHMENT 1

## Astrid B. Furstner

**From:** Mike Murray <mmurray@maulfoster.com>
**Sent:** Thursday, July 20, 2017 5:18 PM
**To:** Sean Sheldrake (sheldrake.sean@epa.gov)
**Cc:** 'Myron.Burr@siltronic.com'; David Rabbino; Ilene M. Munk; BAYUK Dana (dana.bayuk@state.or.us); GREENFIELD Sarah; 'rjw@nwnatural.com'; Carolyn P. Long; Mike Murray; Ted Wall
**Subject:** 2009 Gasco Sediments Order, EPA Docket Number 10-2009-0255 (EE/CA Order) Deliverable
**Attachments:** JRUTILITY01_Wilma_4200_001.pdf; Mf-Area 1 Evaluation.pdf

Dear Sean,

Please find attached documents provided on behalf of Myron Burr, Siltronic Corporation.

Thank you,
-Mike

**MICHAEL R. MURRAY** RG, LHG, EIT | MAUL FOSTER & ALONGI, INC.

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**Myron Burr**
Environmental Affairs Manager

**Siltronic Corporation**
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myron.burr@siltronic.com

2017-07-20

Mr. Sean Sheldrake, RPM, Unit Diving Officer
US EPA, Region 10
Environmental Cleanup Office
1200 Sixth Avenue, Suite 900, ECL-110
Seattle, WA 98101-3140

RE: 2009 Gasco Sediments Order, EPA Docket Number 10-2009-0255 (EE/CA Order)

Dear Sean:

Attached please find a summary of proposed work Siltronic anticipates is needed to better refine the extent of Area 1 as anticipated in the EE/CA Order. More specifically, Siltronic is submitting this attachment to identify sampling work activities additional to those proposed in NW Natural's (NWN) Draft Pre-Remedial Basis of Design Technical Evaluations Work Plan, which was submitted to EPA on July 13, 2017. Siltronic requests that this sampling proposal be integrated into the Draft Work Plan submitted by NWN to ensure proper delineation of the Gasco Sediments Site. Unfortunately, this integration could not occur prior to NWN's submission due to NWN's refusal to consult with Siltronic as a joint and several party under the EE/CA Order. Without action from EPA to either require consultation between the parties or to remove Siltronic from the EE/CA Order, Siltronic will continue to provide EPA with addenda and corrections to address NWN's uncoordinated submissions.

As Siltronic has previously advised, Siltronic is concerned about the current direction and development of the EE/CA Order entered into jointly between Siltronic and NWN. Although the parties are jointly and severally responsible for all work, NWN is serving as the Project Coordinator and the performing entity for the work and is utilizing NWN's consultant. However, contrary to the coordination obligations under the March 2010, *Revised Final Work Plan, Gasco Sediments Cleanup Action*, the terms of which are incorporated into the EE/CA Order, NWN does not provide Siltronic with an opportunity for input before providing deliverables to EPA. This puts Siltronic in a difficult and somewhat untenable position.

In addition, the vast majority of contamination in the uplands and in river sediments is a result of Portland Gas and Coke (PG&C) /NW Natural activities. Therefore, the vast majority of the remediation work should be performed by NWN.

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As you recall, due to the above facts and concerns, Siltronic asked to be removed from this EE/CA Order when we met May 4, 2017 in Seattle. Because EPA has thus far indicated it wishes to keep Siltronic involved in this EE/CA Order, and because NWN continues to refuse to include Siltronic in the submittal development process as otherwise contemplated by the EE/CA Order, Siltronic has no choice but to provide comments and input to EPA as a separate deliverable consistent with the EE/CA Order. Unfortunately, separate, uncoordinated submissions will likely lead to inefficiencies, and the potential to cause delay and confusion.

Finally, in light of EPA's identification of other contaminants of interest (COIs) in this area, including pesticides and dioxins/furans, Siltronic believes it appropriate to understand the role they may play in the design of a remedy as anticipated by this EE/CA Order. Siltronic is concerned, however, whether NWN will also be evaluating the extent of those hazardous substances intermingled with historic PG&C waste to ensure comprehensive and compatible data is collected in all areas covered by the EE/CA Order.

Please feel free to contact me should you have any questions regarding this submission. Thank you very much.

Best regards,

Siltronic Corporation

Myron Burr

Attachment

cc: Mike Murray, MFA, via email
David Rabbino, Jordan Ramis, via email
Ilene Munk and Carolyn Long, Foley & Mansfield, via email
Dana Bayuk, ODEQ, via email
Sarah Greenfield, ODEQ, via email
Robert Wyatt, NW Natural, via email

# MEMORANDUM

To: Myron Burr, Siltronic Corporation

Date: July 20, 2017

From: Michael R. Murray, RG, EIT
Phil Wiescher, PhD

Project: 8128.02.04-02

RE: Approach to Evaluate Area 1

Maul Foster & Alongi (MFA), on behalf of Siltronic Corporation, has prepared the following approach to evaluate impacts to transition zone water (TZW) as related to the in-water design activities required by the United States Environmental Protection Agency (USEPA) Administrative Order on Consent, (AOC) entered into with Northwest Natural (NW Natural) and Siltronic in 2009. (Engineering Evaluation / Cost Analysis [EE/CA] Order or AOC), EPA Docket number 10-2009-0255. The AOC states "the area in the Willamette River on or adjacent to the former oil gasification plant, encompassing approximately 40 acres, located at 7200 NW Front Avenue and 7900 NW St Helens Road in Portland, Multnomah County, Oregon. The Gasco sediments Site includes sediment, surface water, and groundwater where Manufactured Gas Plant, (MGP) wastes and volatile organic compounds (VOC) are present in the Willamette River, as that area will be determined in accordance with the project area identification process described in the [Statement of Work] SOW." [1]

## AREA 1 TZW DATA GAPS AND APPROACH

Within the AOC and associated SOW Figure 1, Area 1 is defined as trichloroethylene (TCE) and its degradation products (DPs; specifically cis-dichloroethylene (cDCE) and vinyl chloride, or VC) in transition zone water (TZW) exceeding the 2005 Portland Harbor Joint Source Control Strategy Screening Level Values (JSCS SLVs)[2].

The Gasco Sediments Site Engineering Evaluation / Cost Analysis (EE/CA) Proposed Remedial Alternative 5 is similar to the ROD selected remedy (Alternative F MOD). The extent of potential sediment removal, and follow-up capping (or covering) under EE/CA Proposed Remedial Alternative 5 generally encompasses Area 1, based on existing sediment data. Therefore, most of Area 1 will need

[1] Paragraph 12(h) of Section III of the 2009 EE/CA Order, page 8.

[2] As reported in the 2012 draft Gasco Sediment Site Engineering Evaluation/Cost Analysis (EE/CA): TCE = 30 ug/L; cis-1,2-dichloroethene cDCE) = 70 ug/L; VC = 2.4 ug/L

to be evaluated for dredging to remove impacted sediment. This dredging would be followed by either an engineered cap, or a simple sand cover.[3]

The Enhanced In-situ Bioremediation (EIB) system installed by Siltronic has removed an estimated 96% of the chlorinated VOCs (CVOCs) in groundwater near the former TCE underground storage tank location[4] and the 2010 TZW sampling showed significant decreases in CVOCs in TZW[5]. The current nature and extent of hazardous substances in TZW and shallow in-river groundwater in Area 1 are unknown. Current concentrations of hazardous substances in deeper in-river groundwater, which may also impact cap/cover design in Area 1, are unknown. The results of this data collection would be used to redefine the extent of the TZW and groundwater impacts in Area 1.

As noted above, Area 1 was originally defined using JSCS SLVs. The 2017 USEPA Record of Decision (ROD) specifies cleanup levels (CULs) for groundwater required to meet Remedial Action Objectives (RAOs) 4 and 8. Note that the CULs represent those levels expected to be achieved after remedy implementation. MFA recommends developing and implementing a comprehensive TZW and groundwater sampling program to delineate the current extent of impacted TZW consistent with the ROD CULs. TZW and in-river groundwater samples should be analyzed for the full suite of organic and inorganic compounds, consistent with upland groundwater monitoring, as well as any compound with a ROD CUL. Results of the data collection would be used to define the current extent of TZW impacts in Area 1.

MFA understands that NW Natural is proposing to evaluate the discharge/recharge relationship between groundwater and surface water, which may be accomplished by deploying a combination of distributed temperature sensing (DTS, using fiber-optic cable) and seepage meters. MFA also recommends such an approach. The locations of these data collection efforts should be determined by the analytical data used to redefine the area of TZW impacts. These data will also support cap or cover design.

## SEDIMENT DATA GAPS AND APPROACH

As noted above, due to the presence of NW Natural wastes, including MGP wastes, sediment throughout Area 1 was identified for removal based on either the EE/CA Alternative 5 or the ROD Alternative F-MOD remedial action levels developed for sediment, pending final project area identification and application of the ROD technology decision tree. At this time, the extent of sediment requiring removal is unknown, but is likely to include Area 1.

[3] To be determined based on evaluation consistent with the ROD technology decision tree.

[4] MFA. 2016. Memorandum (re: Source Area CVOC Reduction Progress Report – Siltronic [ECSI 183]). Maul Foster & Alongi, Inc., Portland, Oregon. May 31. (document attached for reference).

[5] As reported in the 2012 Draft Gasco Sediment Site EE/CA, page A-26 and A-27, (excerpt of document attached for reference).

Should dredging occur in Area 1, the cost of dredged sediment disposal can be significant. Additional surface and subsurface sediment sampling and analysis within Area 1 to anticipate appropriate management of remediation waste is warranted[6].

## CONCLUSION

The sampling approach described herein is intended to provide a comprehensive and current understanding of the presumed area of TZW impacts to support remedial alternative design and waste disposal data needs. We see this sampling as a necessary precursor to successful design.

[6] We presume this same discussion will be warranted for all areas slated for dredging and off-site disposal; however, this memorandum is confined to concerns of Area 1.

# ATTACHMENT 1

used to determine isoconcentration boundaries for the 2010 and 2004/2005 sampling events based on the following screening criteria[2]:

- TCE exceeding 3.0 μg/L
- Cis-1,2-DCE exceeding 70 μg/L
- VC exceeding 2.4 μg/L

The modeled isoconcentration boundaries for the 2010 and 2004/2005 sampling event for TCE are presented in Figure 4-5. Because TCE was not detected at concentrations greater than 3 μg/L during the 2010 sampling event, no isoconcentration boundary was determined for the 2010 sampling event. The reduction in area (i.e., from 0.08 acres to 0 acres) between the two events is therefore 100 percent. Concentrations of TCE exceeding 3.0 μg/L in 2004/2005 were generally localized in the center of Area 1.

The modeled isoconcentration boundaries for the 2010 and 2004/2005 sampling event for cis-1,2-DCE are presented in Figure 4-6. The isoconcentration boundary of cis-1,2-DCE above 70 μg/L was smaller for the 2010 sampling event than for the 2004/2005 sampling event. The reduction in area (i.e., from 0.62 acres to 0.19 acres) between the two events was calculated to be 70.2 percent. Concentrations of cis-1,2-DCE exceeding 70 μg/L were generally localized to the center of Area 1.

The modeled isoconcentration boundaries for the 2010 and 2004/2005 sampling event for VC is presented in Figure 4-7. The isoconcentration boundary VC above the 2.4 ug/L screening level was smaller for the 2010 sampling event than for the 2004/2005 sampling event. The reduction in area (i.e., from 2.2 acres to 1.4 acres) between the two events was calculated to be 35.9 percent.

## 4.3 Transition Zone Water and In-River Groundwater Investigation Conclusions and Discussion

The following conclusions have been developed based upon the TZW and in-river groundwater data collected to date:

[2] DEQ directed the use of these screening criteria in 2005 for the purpose of mapping TZW data and prioritizing the site for upland source control. These criteria were carried forward with the 2010 data set for consistency. Trans-1,2-DCE and 1,1-DCE were not mapped due to a lack of screening criteria exceedances.

1. During the recent sampling, TCE was detected in five samples; cis-1,2-DCE was detected in 13 samples, and VC was detected in 12 samples. Ten of the VC concentrations exceeded the HH-org (2.4 µg/L). No other human health risk screening values or ecological risk screening values were exceeded in the TZW or in-river groundwater samples.
2. While there were several VC exceedances of the HH-org criteria, concentrations of VC have decreased in all but one location (GP65-W-3) since the 2004/2005 sampling event.
3. Natural attenuation of TCE and its degradation products by reductive dechlorination has been confirmed as an ongoing process.
4. Based upon isoconcentration contours for cis-1,2-DCE and VC, the lateral extent of Area 1 has been reduced respectively by 70 percent (from 0.62 acres to 0.19 acres) and 35 per cent (from 2.2 acres to 1.4 acres) since 2004/2005, respectively. TCE is not present above the HH-org screening level value.

## 4.4 Transition Zone Water and Groundwater Data Gaps

The potential data gaps driving the investigation of Area 1 TZW and groundwater included 1) determining whether or not natural attenuation is occurring; and 2) further evaluating the lateral extent of Area 1. As noted previously, the data show that natural attenuation by reductive dechlorination is occurring, and the lateral extent of Area 1 has significantly diminished since collection of the 2004/2005 data. No other data gaps remain regarding the nature and extent of TCE and its degradation products in Area 1.

# ATTACHMENT 2

# MEMORANDUM

To: Mr. Keith Johnson, NWR Cleanup Manager
Mr. Dana Bayuk, DEQ Project Manager

Date: May 31, 2016

From: James G.D. Peale, RG and Michael R. Murray, RG

Project: No. 8128.02.02-03

Re: Source Area CVOC Reduction Progress Report—Siltronic (ECSI 183)

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The following is a progress update for the in situ chemical reduction (ISCR) enhanced bioremediation (EIB) at the Siltronic site, as it relates to active chlorinated volatile organic compound (CVOC) remediation in the source area. The last such update was provided to the DEQ on June 10, 2015. The objective of this document is provide a brief technical summary for communications between and among the members of the DEQ Northwest Region Cleanup and Site Assessment Section Team.

In summary, the analysis of monitoring results confirm:

- Successful attainment of remedial action objective 1 (RAO 1) at all of the source area monitoring wells.
- Trichloroethene (TCE) mass reduction of 99.90 percent and an overall CVOC mass reduction of 95.85 percent.
- Sustained attainment of the USEPA maximum contaminant level for TCE in all but two of the source area monitoring wells during recent sampling events (late 2015–early 2016).

The ISCR-EIB pilot-study injection program was completed in 2006, with subsequent monitoring in four wells. Larger-scale ISCR-EIB injections began in January 2009 and were completed in June 2009. Source-area monitoring included an additional 20 wells from November 2008, and after monitoring-program reductions presently includes 15 wells. Supplemental injections, upgradient of the 2009 injections, were completed in 2011, with monitoring continuing in four more wells.

This memorandum reviews the analysis of the monitoring data and presents the conclusions related to the ongoing performance of EIB, including mass removal estimates and performance toward achieving the RAO (i.e., TCE concentrations below 11,000 micrograms per liter [ug/L]).

## MASS REMOVAL ESTIMATES USING EVS

Data from the monitoring wells are regularly modeled with Environmental Visualization System© (EVS) software for estimating the mass of TCE and its degradation products in the source area, using standard 3D-kriging statistical techniques. The result of this analysis is presented as a time-series plot of the aggregate source-area CVOC mass in groundwater. Figure 1 (below) shows that the TCE mass was rapidly reduced, and the degradation product, (cis) 1,2-dichloroethylene (cis-1,2-DCE), initially increased as expected. The cis-1,2-DCE mass decreased after July 2009. Vinyl chloride (VC) was also produced as expected, but at significantly lower concentrations. VC production peaked in February 2012 and then decreased.

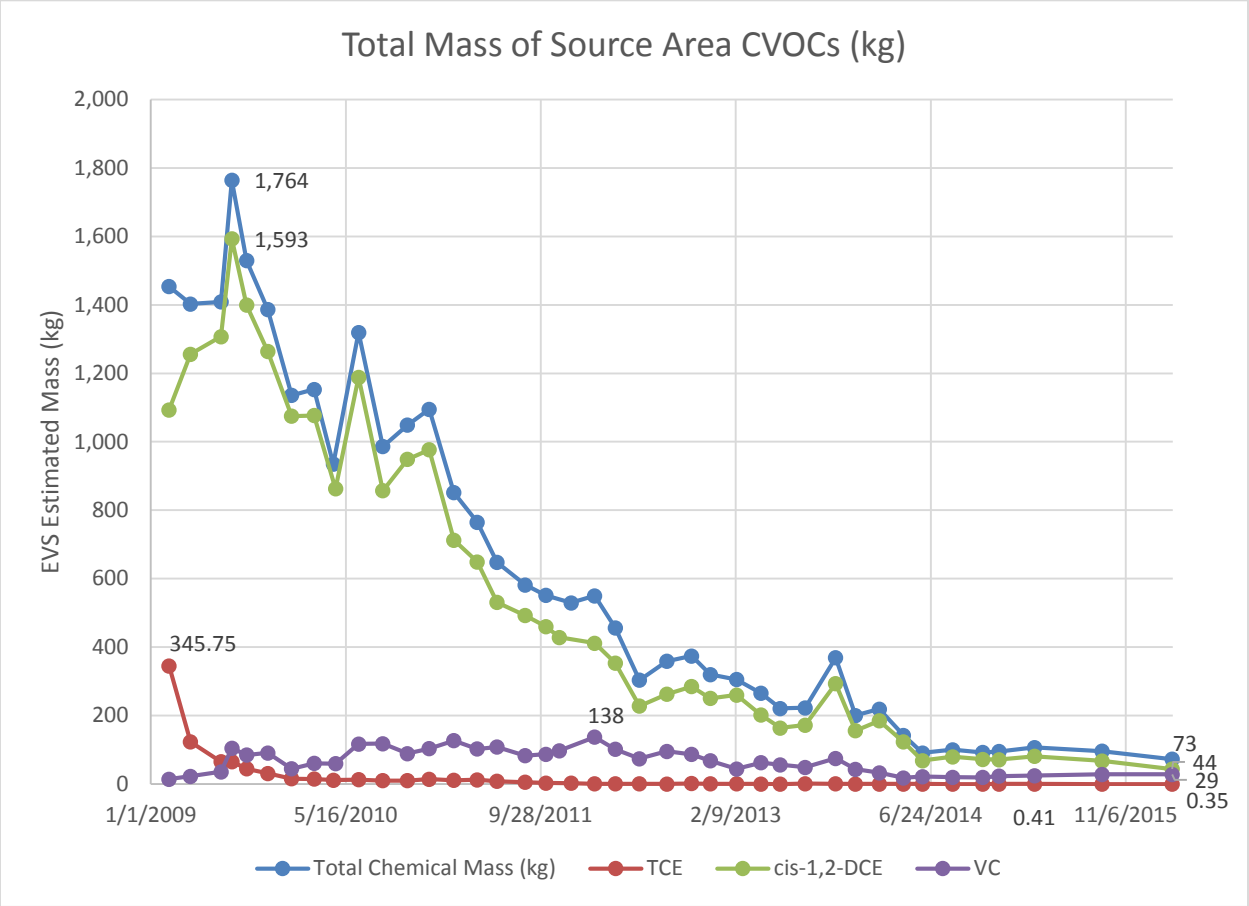


**Figure 1—EVS Estimated Mass of CVOCs in the Source Area. Maximum and most recent data points (used for calculations in Table 1) are labeled.**

The mass removal information is also summarized in Table 1, and confirms that relative to the initial or maximum estimated mass values, ISCR-EIB has removed more than 99 percent of the source TCE and more than 95 percent of the total CVOCs.

**Table 1—Mass Removal Statistics. Mass reduction was calculated using the most recent data compared to the initial (TCE) or subsequent maximum (cis-1,2-DCE and VC) values.**

| | Sum CVOCs | TCE | cis-1,2-DCE | Vinyl Chloride |
|---|---|---|---|---|
| Initial or Max Estimated Mass (kg) | 1763.7 | 345.8 | 1592.7 | 137.7 |
| Mass Reduction (kg) | 1690.6 | 345.4 | 1548.7 | 108.9 |
| % Mass Reduction | 95.85% | 99.90% | 97.24% | 79.08% |
| NOTE:<br>kg = kilogram(s). | | | | |

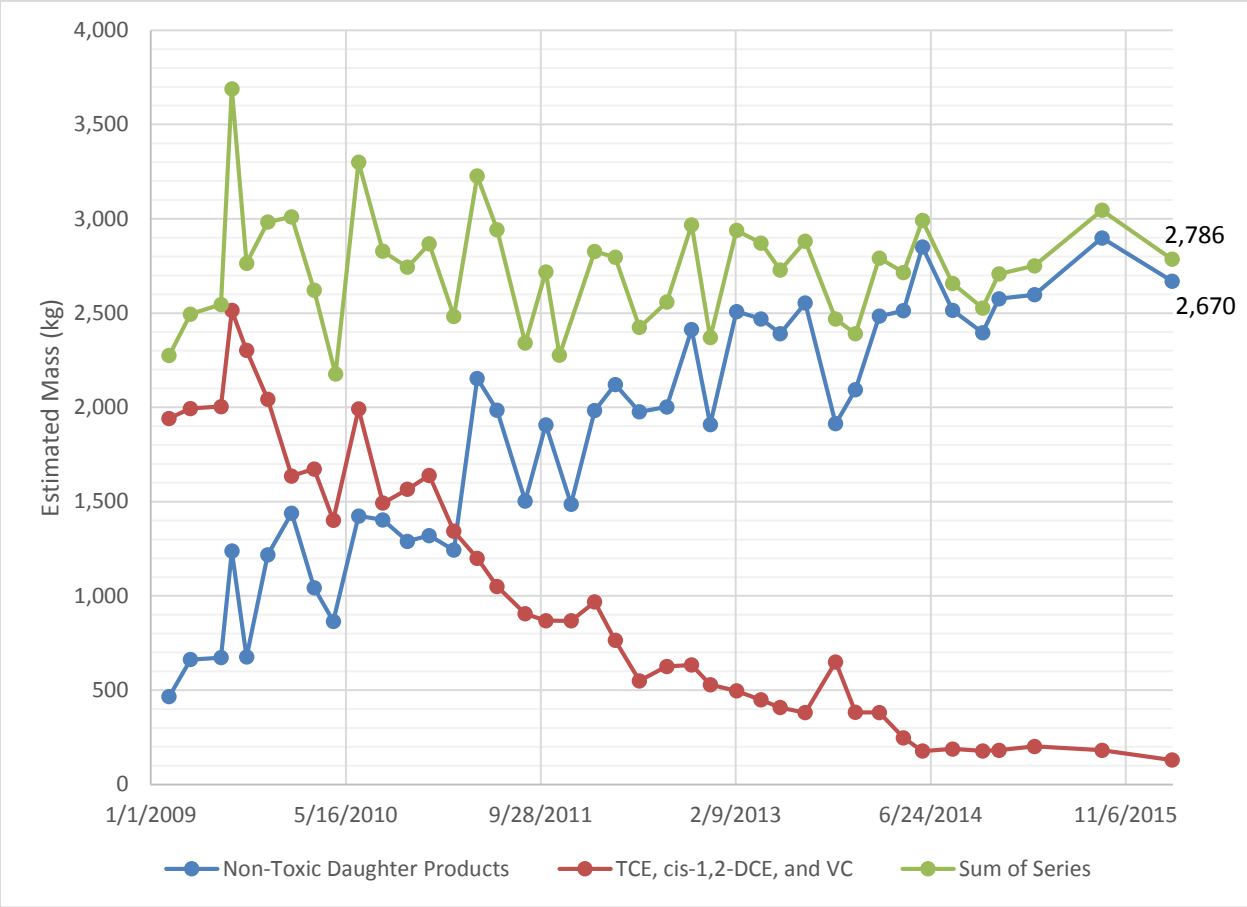


**Figure 2—Estimated Mass of TCE Equivalents from Non-Toxic Daughter Products and CVOCs**

Another view of the data confirms the ongoing conversion of CVOCs to ethene and chloride, non-toxic daughter products of CVOC degradation. Figure 2 shows the estimated mass for three data sets:

1) The total estimated mass of CVOCs (TCE, cis-1,2-DCE, and VC)[1]
2) The estimated mass of the terminal, nontoxic degradation products, primarily chloride, but also ethene
3) The sum of the first two series to demonstrate nearly complete conversion

Figure 2 shows that the significant reduction of the chlorinated VOCs results in the continued generation of nontoxic chloride and ethene, which currently comprise approximately 96 percent of the total estimated mass of parent and daughter products. The sum of the series fluctuates but stays fairly constant (between 2,500 and 3,000 kg), confirming the mass balance of the degrading CVOCs vs. the stable chloride concentrations.

## PERFORMANCE RELATIVE TO RAO 1

RAO 1 for the source area is to reduce TCE concentrations in all wells to below the threshold indicative of the probability of the presence of TCE-dense nonaqueous-phase liquid (DNAPL) (i.e., 11,000 ug/L in groundwater). Three wells were selected to evaluate the timeframe for reaching the RAO. These wells are described below:

- WS-13-69 was installed immediately below the former TCE underground storage tank system, with sustained TCE concentrations characteristic of a DNAPL release (although TCE DNAPL was never observed). This well was monitored after completion of the initial injection program. All of the remaining wells monitored in the source area following the initial injection program reached the RAO before WS-13-69. The RAO was attained in this well eight months after injection. Concentrations are now approximately 4 orders of magnitude below the RAO.
- WS-41-91 was installed deeper than and upgradient of WS-13-69 to monitor performance after the supplemental injection program in 2011. The RAO was attained in this well within seven months after injection. Concentrations are now approximately 4 orders of magnitude below the RAO.
- WS-43-36 was installed in the fill zone and represents an area of Portland Gas & Coke (PG&C) waste DNAPL with entrained TCE DNAPL. Concentrations of TCE in groundwater from this well reflect ongoing desorption of TCE from the PG&C/TCE DNAPL mixture, but have remained below the RAO since the end of 2013. The RAO was attained in this well 25 months after injection. Concentrations are now 2.4 times lower than the RAO.

The data in Table 2 confirm that ISCR-EIB was extremely effective for rapidly reducing TCE concentrations to levels well below the RAO, mostly within months after completion of the

[1] To account for stoichiometric generation of daughter products, EVS-generated mass estimates of all species were converted to molar data to calculate equivalent moles of TCE as the parent material; the equivalent moles were then converted back to the estimated mass of TCE equivalents. The sum of TCE, cis-1,2-DCE, and VC as TCE equivalents shown on Figure 2 is therefore greater than the estimated mass of TCE, cis-1,2-DCE, and VC measured in groundwater as shown on Figure 1.

injection programs. ISCR-EIB was also effective for achieving the RAO—in spite of the presence of the PG&C/TCE DNAPL mixture in the well and the subsurface. Source area wells have demonstrated ongoing TCE concentrations below the USEPA maximum contaminant level for TCE in all but two of the monitoring wells during recent sampling events (late 2015–early 2016).

**Table 2—RAO Performance**

| Well | Date Monitoring Started | Date of Max TCE | Max TCE (ug/L) | Date RAO 1 Met | Current TCE (ug/L) |
|---|---|---|---|---|---|
| WS-13-69 | 04/13/2009 | 09/03/2009 | 122,000 | 12/16/2009 | 2.48 |
| WS-41-91 | 04/05/2011 | 06/20/2011 | 90,800 | 11/15/2011 | 1.8 |
| WS-43-36 | 04/26/2011 | 11/29/2011 | 83,800 | 12/03/2013 | 4,550 |

## SUMMARY

Based on monitoring well data and the EVS-generated mass estimates, ISCR-EIB has significantly reduced the CVOC source-area mass and continues to be effective at reducing the mass of residual degradation products. Data from the individual wells confirm that ISCR-EIB was effective for achieving RAO 1 for this area, often within months after injection. These results demonstrate that, as expected, the Siltronic bioremediation project is significantly reducing CVOCs.

These data confirm successful in situ remediation of a chlorinated solvent DNAPL source at an active manufacturing facility, and reflect a significant and groundbreaking technical accomplishment on the part of Siltronic and the DEQ technical staff.

# ATTACHMENT 2

**Astrid B. Furstner**

**From:** Sheldrake, Sean <sheldrake.sean@epa.gov>
**Sent:** Tuesday, July 25, 2017 11:49 AM
**To:** Mike Murray
**Cc:** 'Myron.Burr@siltronic.com'; David Rabbino; Ilene M. Munk; BAYUK Dana (dana.bayuk@state.or.us); GREENFIELD Sarah; 'rjw@nwnatural.com'; Carolyn P. Long; Ted Wall; Lance Peterson (PetersonLE@cdmsmith.com)
**Subject:** RE: 2009 Gasco Sediments Order, EPA Docket Number 10-2009-0255 (EE/CA Order) Deliverable SF
**Attachments:** 2009 Gasco Sediments Order, EPA Docket Number 10-2009-0255 (EE/CA Order) Deliverable

Hello Mike and Myron,

As EPA has stated in past meetings, I would suggest Siltronic work with NWN to send EPA comprehensive deliverables, that include all respondent concerns. I will place your letter in our file, but we intend to review the deliverable as submitted.

Thank you.

S

Sean Sheldrake, Unit Diving Officer, RPM
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**From:** Mike Murray [mailto:mmurray@maulfoster.com]
**Sent:** Thursday, July 20, 2017 5:18 PM
**To:** Sheldrake, Sean <sheldrake.sean@epa.gov>
**Cc:** 'Myron.Burr@siltronic.com' <Myron.Burr@siltronic.com>; David Rabbino <David.Rabbino@jordanramis.com>; Ilene M. Munk (imunk@foleymansfield.com) (imunk@foleymansfield.com) <imunk@foleymansfield.com>; BAYUK Dana (dana.bayuk@state.or.us) <dana.bayuk@state.or.us>; GREENFIELD Sarah <sarah.greenfield@state.or.us>; 'rjw@nwnatural.com' <rjw@nwnatural.com>; Carolyn P. Long <clong@foleymansfield.com>; Mike Murray <mmurray@maulfoster.com>; Ted Wall <twall@maulfoster.com>
**Subject:** 2009 Gasco Sediments Order, EPA Docket Number 10-2009-0255 (EE/CA Order) Deliverable

Dear Sean,

Please find attached documents provided on behalf of Myron Burr, Siltronic Corporation.

Thank you,
-Mike

**MICHAEL R. MURRAY** **RG, LHG, EIT** | MAUL FOSTER & ALONGI, INC.

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